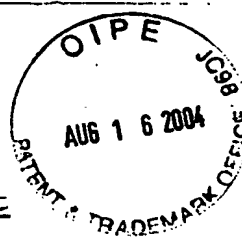


CERTIFICATION

I, Lesley Marion Scarborough, of Redcliff Quay, 120 Redcliff Street, Bristol, England, hereby certify that I am the translator of the accompanying translation of the attached German text marked K:\ausland\OZ03005.doc, and certify that, to the best of my knowledge and belief, the translation into English herein provided is in fact a literal and true interpretation of the statements in the original language, German.

L.M. Scab   
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Dated this 3rd day of August 2004

Pyromechanical separating element

The invention relates to a pyromechanical separating element.

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Separating elements which are driven by pyrotechnic fuels are known that are mostly constructed in the form of screws and are provided with a gas-forming charge in a specially formed hollow space. An ignition element, which can be triggered electrically or mechanically, as and when required ignites this pyrotechnic substance that generates a very high pressure and tears the screw apart at a certain pre-weakened predetermined breaking point. The problems with these screws exist as a rule during normal operation during which mechanical assemblies are to be held together with a certain holding force. As a result of temperature-expansion/contraction processes and alternating mechanical loads, as a rule these predetermined breaking points represent an unintentional weakening for long-term operation. This problem is solved in that the thickness of the rest of the wall of the predetermined breaking point is over-dimensioned. The consequence of this in turn, however, is that very high pressures are required for the separation. However, there are many applications in which separating elements are merely to hold two components together and the normal operating forces are not very high. In the case of separating screws with predetermined breaking points that are incorporated therein, the ignition elements and the charges must also be installed so that they oppose the high pressure in such a way that the ignition mechanism is not centrifuged out during the separating process.

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The underlying object of the invention is to develop a pyromechanical separating element which allows the separating force to be set in the case of intentional triggering in a manner defined in accordance with the task and which at the same time consists of a small number of individual parts. In accordance with the invention this object is achieved by means of the features of claim 1. An important feature is the use of already hermetically sealed pyrotechnic pressure elements, and the introduction of a special construction element which allows the separating force to be set in the case of intentional triggering in a manner defined in accordance with the task. This construction element is, in accordance with the invention, an arresting and force-limiting element with which the latching pin is anchored on the housing.

In a preferred embodiment, the arresting and force-limiting element is a plate spring with preferably crown-shaped incisions which in the latched state sits both in a latching-pin groove in the latching pin and in a housing groove.

Alternatively, the arresting and force-limiting element can also be a sheet-metal ring or a spring ring which in the latched state sits both in a latching-pin groove and in a housing groove.

In another embodiment, the arresting and force-limiting element is a radial projection on the latching pin that engages into a housing groove on the housing.

Advantageously, arranged on the outer circumference of the latching pin there is a sealing ring which is let into a groove.

Further features of the invention emerge from the figures which are described in the following and in which:

- 5     Figure 1    shows an embodiment of a pyromechanical separating element with a plate spring with crown-shaped incisions as an arresting and force-limiting element;
- 10    Figure 2    shows an embodiment that is analogous to that of Figure 1, yet with a sheet-metal ring as the arresting and force-limiting element;
- 15    Figure 3    shows an embodiment that is analogous to that of Figure 1, yet with a spring ring as the arresting and force-limiting element; and
- 20    Figure 4    shows an embodiment that is analogous to that of Figure 1, yet with a radial projection on the latching pin as the arresting and force-limiting element.

Figure 1 shows the pyromechanical separating element in accordance with the invention that is installed in a tube clip which is to be released if the need arises.

The pyromechanical separating element substantially consists of the housing 1, into which the pyrotechnic pressure element 2 is inserted by way of an insulating body 3, the electrical connector system 4, the latching pin 5, the securing rings 6, 7 and the arresting and force-limiting element 8. This arresting and force-limiting element 8 can be constructed in different ways. In exemplary embodiment 1 (Figure 1) this arresting and force-limiting element 8 is constructed as a plate spring with crown-shaped incisions. In the

latched state this element sits in the latching-pin groove 9 and in the housing groove 10. If attempts are made to pull the latching pin 5 and the housing 1 apart, the arresting and force-limiting element 8 locks. Only after a force that is set by the spring tension of this element and by the geometrical shape of the arresting and force-limiting element 8 and the grooves 9, 10 has been overcome can the latching pin 5 be pulled out of the housing 1.

The two clip ends 11, 12, which are fixedly connected to the pyromechanical separating element, are held fast even in the case of mechanical loads that are high under normal conditions and seek to pull the clip together or apart. It is only in the case of intentional separation, for example as a result of emergency situations or overload situations, that an electric current-surge acts on the pyrotechnic pressure element 2 connected by way of the electrical connector system 4, the pyrotechnic pressure element 2 is ignited, and a driving pressure that is high as a result of the combustion of the pyrotechnic substance is generated in the driving volume 19, pressing, in turn, on the latching pin 5.

The force that results from the pressure and the area of the latching pin 5, when the holding force of the arresting and force-limiting element 8 is exceeded, is able to separate the latching pin 5 and the housing 1. The securing rings 6, 7 in this embodiment have to ensure that the two portions remain firmly fixed at the clip ends and cannot fly away.

During the separating process, the arresting and force-limiting element 8 is deformed in such a way that the

edges of the housing groove 10 and the latching-pin groove 9 shear off the plate-spring crown elements.

In Figure 2, the arresting and force-limiting element 8  
5 is constructed as a sheet-metal ring. In the case of this element, when the resistance to the pulling-out action is overcome, direct punching of the sheet-metal ring is also achieved by way of the pulling-out force that results from the driving pressure of the  
10 pyrotechnic pressure element 2.

Figure 3 shows a further embodiment of the arresting and force-limiting element 8 as a spring ring. Here the spring tension and groove shape determine both the  
15 level of the holding force and that of the resistance to the pulling-out action.

After the housing 1 has been plugged together with the latching pin 5, in whose groove 9 the arresting and  
20 force-limiting element 8 is located, the latter snaps into the groove 10 that is provided in the housing 1 and blocks the extraction. The pyromechanical separating element can now be inserted into the clip ends 11, 12 and can be secured under compression by  
25 means of the securing rings 6, 7.

Another embodiment of the separating element in accordance with the invention is shown in Figure 4. The latching pin 5 is constructed in such a way that it  
30 presses against the shoulder of the housing groove 16 during assembly and then is deformed with a high force of pressure. This process in principle represents a kind of riveting. The form of the groove 17 and the projection 18 and the type of material construction  
35 allow different latching forces to be set. The

projection 18 in this case represents the arresting and force-limiting element 8.

In order to seal the driving volume 19 it is  
5 advantageous to arrange on the outer circumference of the latching pin 5 a sealing ring 20 which is let into a groove. In the same way, a sealing ring should be arranged on the insulating body 3.